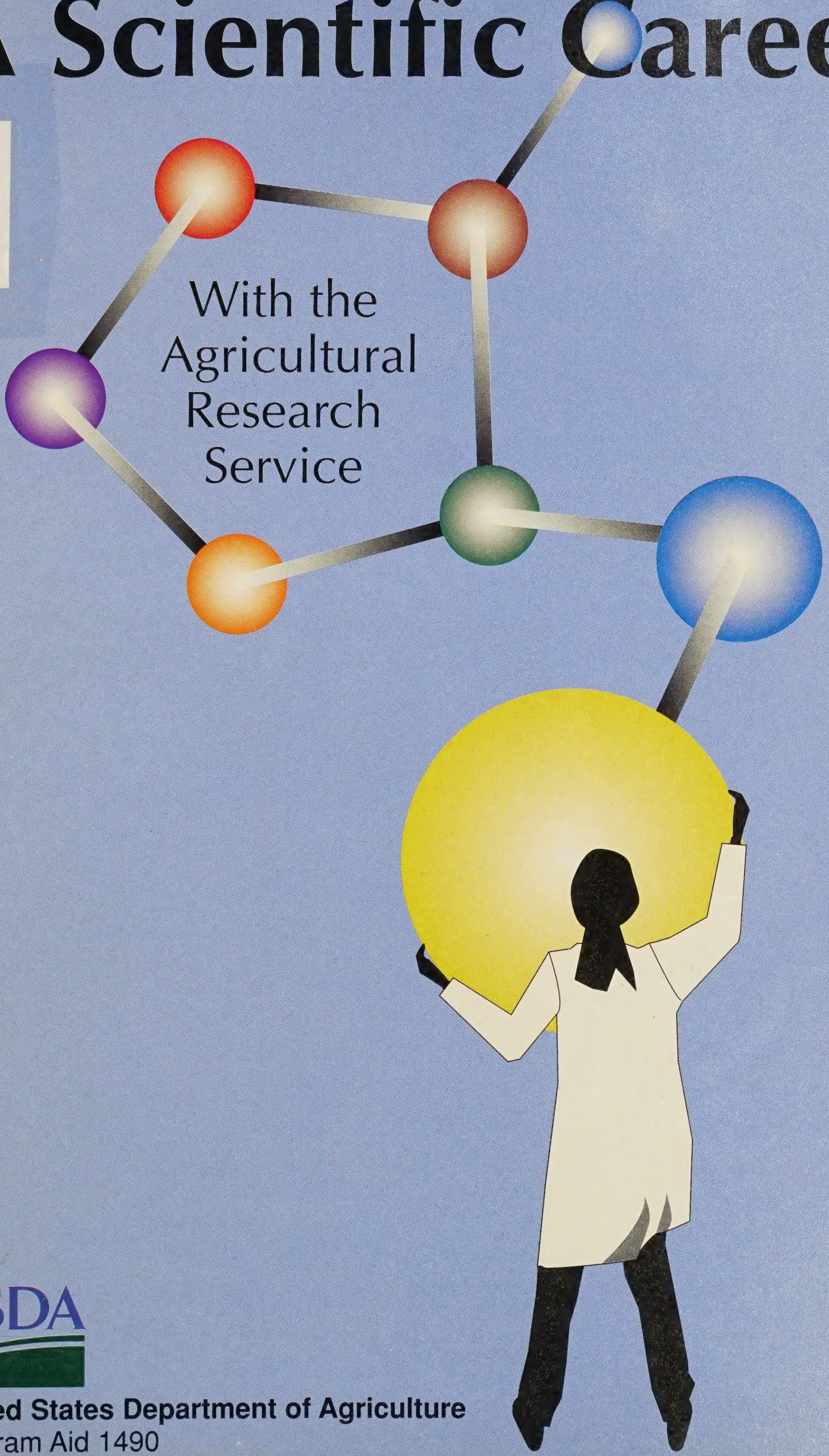
A Scientific Career

With the Agricultural Research Service



USDA

United States Department of Agriculture

Program Aid 1490

Vision: It's the Mission

ARS conducts research to develop and transfer solutions to agricultural problems of high national priority and provides information access and dissemination to ensure high-quality, safe food and other agricultural products, assess the nutritional needs of Americans, sustain a competitive agricultural economy, enhance the natural resource base and the environment, and provide economic opportunities for rural citizens, communities, and society as a whole.

In pursuing these goals, ARS is aiming at five general outcomes:

1. An agricultural system that is highly competitive in the global economy.

2. A safe and secure food and fiber system.

3. A healthy, well-nourished population.

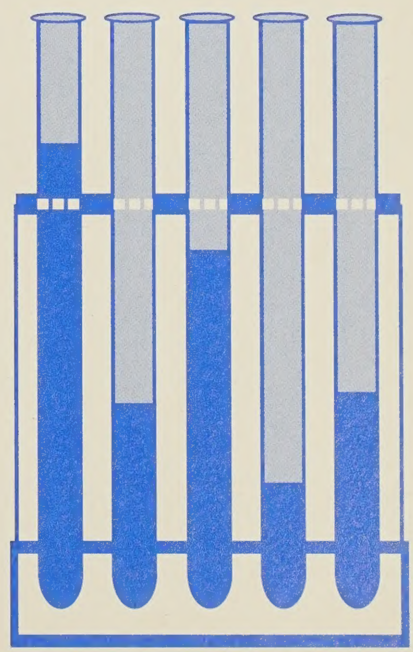
4. Greater harmony between agriculture and the environment.

5. Enhanced economic opportunity and quality of life for farmers, ranchers, rural citizens, and communities.

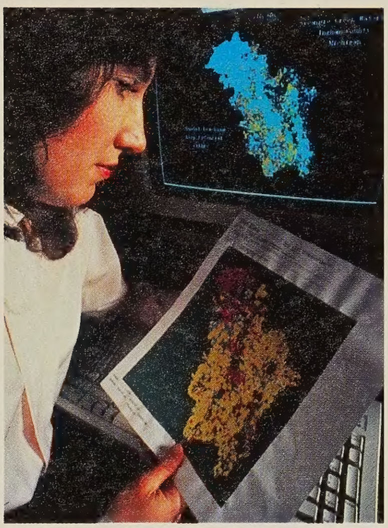
In meeting these goals, ARS provides producers, consumers, action agencies, industry, and others in the research community with a wealth of information concerning agricultural science.

A new multiplatform graphical Windows interface is being developed to support transfer of the WEPP (Water Erosion Prediction Project) prediction technology to field users. Computer programmer-analyst Hailiang Fu (left) and agricultural engineer Dennis Flanagan discuss the design of the watershed top view and profile side view interface screens at the USDA-ARS National Soil Erosion Research Laboratory in West Lafayette, Indiana.
(K7569-11)

We're growing our own printer's ink these days. Chemist Sevim Erhan tests experimental soybean-based inks on a "Little Joe" printing press. (K3997-5)



Yesterday, Today, and Tomorrow



Range scientist Patricia Bartling reviews land-use data to be fed into a computer model. The program helps protect aquifers from pollution by predicting potential leaching of nitrate nitrogen. (K4012-17)

Although the Agricultural Research Service of today is the largest such organization in the world, its beginnings, in the early 1950's, were modest. At that time, scientific research in USDA was carried out separately at several facilities around the country. These were consolidated to create the original USDA research agency—ARS.

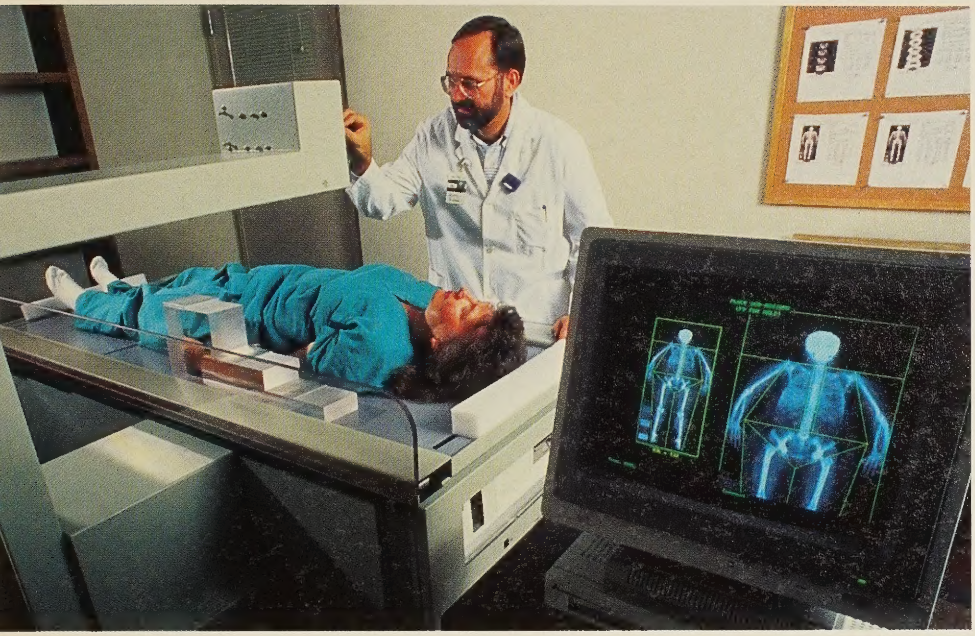
Many landmark discoveries and observations by scientific pioneers in agriculture became avenues that continue to lead in productive and fascinating directions. Today's ARS scientists often find themselves in the vanguard of technological excitement that cuts across traditional boundaries.

Let's start with biotechnology, a term that applies to 10-12 percent of our programs. ARS researchers use such state-of-the-art techniques as cell and tissue culture, protoplast fusion, embryo manipulation and transfer, and recombinant gene transfer. Many of these projects implement genetic engineering, a development recently termed by a panel of experts as "one of the four major science revolutions of this century, on a par with unlocking the atom, escaping Earth's gravity, and the computer revolution."

Of the 100 studies recently selected for the ARS Research Associate Program (see page 16) many fall under the heading of biotechnology, and most involve molecular biology. ARS is also cosponsor, with the University of California and the California State Experiment Station, of the Plant Gene Expression Center based at Albany, California.

Here's just a sampling of the recent developments or discoveries by ARS scientists:

- Embryos and fertilized eggs that can be transplanted from cows of superior genetic quality to surrogate mothers.
- Low-cost procedures for transferring livestock ova to a surrogate mother to produce twins, triplets, or even quadruplets from a single egg.
- New rice plants, developed through tissue culture, with more and better quality protein, as well as a method for increasing the protein content of rice flour from 8 percent to 25 percent.
- Dwarf fruit trees that produce higher yield per acre and are easier to harvest.



In determining regional and whole-body bone and soft tissue composition, Henry Lukaski gets a little help from a study volunteer. (K4763-13)

- Through molecular biology, new vaccines to prevent diseases in animals and poultry, such as a recent inoculum to curb foot-and-mouth disease in livestock.

- The use of monoclonal antibodies to detect both animal and plant diseases and to study proteins that may form the basis for new animal vaccines.

- Importation of more insects to combat pest insects, including stingless wasps from Europe to protect alfalfa from the alfalfa blotch leafminer.

- Chemicals from insects, plants, and other natural sources that control or disrupt the growth and reproduction of insect pests.

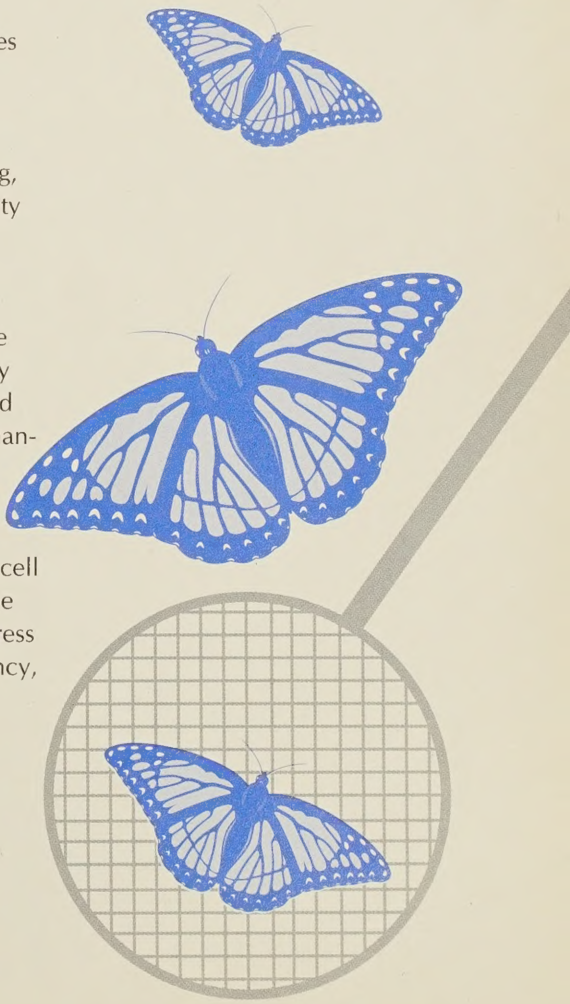
- Increasing use of sex pheromones and other semiochemicals to trap and eradicate a growing variety of insect pests.

- Many new findings in human nutrition, including the fact that too much salt and not enough potassium in U.S. diets are increasing Americans' chances of developing hypertension.

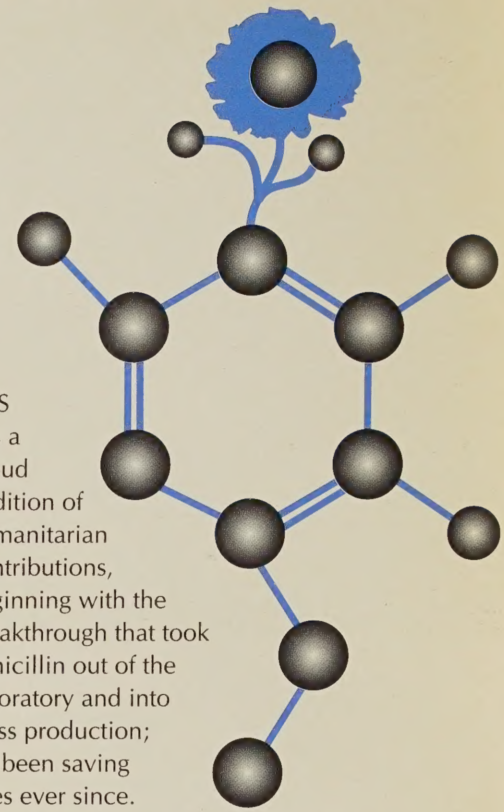
- Solution of many problems associated with no-till farming, to help extend the applicability of this promising system for conserving soil and water.

- Computer models that use the knowledge of experts in many scientific fields to monitor and solve a growing number of management and technological problems.

- Predetermination of sex by a cell sorter and laser beam offer the livestock industry faster progress in genetics, increased efficiency, and greater production flexibility.



Research With a Payoff



Agricultural research continues to push the envelope. Not only does it increase the return on investment for producers; ARS work on value-added products also helps enhance America's market position abroad—through better fabrics, new ways to improve dairy products, biodegradable food wraps, and inks made from soybean oil instead of petroleum, to name just a few advancements resulting from ARS research.

Agricultural research more than pays for itself. Nearly every estimate of the rate of return on investment in agricultural research over the past three decades is between 35 and 45 percent a year, and the production figures for the last 5 years show an annual return higher than 45 percent. The transfer of ARS-generated technology into the private sector adds clout to American competitiveness in world markets. One example: The water-locking commercial success known as Superslurper, with uses as diverse as fuel filters and disposable diapers, was devised by ARS as a new use for surplus corn.

ARS has a proud tradition of humanitarian contributions, beginning with the breakthrough that took penicillin out of the laboratory and into mass production; it's been saving lives ever since. At the foundation of the worldwide Green Revolution was ARS-collected germplasm containing genes for hardier, more productive wheat. Result: Yields in less-

A peek at the interior of a heifer via ultrasound scanner reveals a close-up of reproductive structures. (K4322-20)

Chemical engineer Patricia Slininger is developing the necessary technology to mass-produce Pseudomonas fluorescens, *a biocontrol agent against take-all, a wheat disease. (K4210-15)*

developed nations increased so dramatically that whole populations have become self-sufficient in agriculture.

And the future of scientific inquiry in agriculture promises to be even more challenging and exciting. We foresee the day when:

- Better ways will be found to curb postharvest losses of grain, which in developing countries keep as much as 40 percent of harvested crops from reaching consumers' tables.
- Crops will be much less susceptible to insect damage and disease.
- Insect, weed, and disease control will be carried out effectively without polluting the environment or otherwise endangering human health.
- High crop yields can be sustained without damage to basic natural resources like soil and water.
- More crops will be able to fix their own nitrogen in the soil.
- The rate of efficiency of photosynthesis will be increased from the present 1 percent to 10 percent through enhancement of a plant's energy conversion systems.
- Through genetics, plant growth will be modified to obtain higher ratios of edible to nonedible parts, longer seedfilling times, improved structural strength, and higher yields of economically important plant constituents.
- The nutritive value of many crops, including small grains, will be improved.
- Plant growth will be regulated to allow harvest of fruits and vegetables of uniform ripeness.
- Sex ratios of animal offspring will be controlled; males or females will be produced as desired.
- Livestock will be protected against injury from insects, parasites, and disease.
- Membrane research will lead to improved crop nutrition, better conversion of solar energy, and targeted delivery of drugs.
- The effects of trace minerals, vitamins, and other nutrients on human health and well-being will be more fully understood.
- New foods, from either unexploited plant species or new byproducts, will reduce our dependence on some 18 basic crops, including 5 that provide about 60 percent of human caloric intake.

The Agricultural Research Service is seeking new scientists with the intelligence, daring, and vision to explore the global challenges facing tomorrow's agriculture.

Questions and Answers About Jobs With ARS

How can I learn about job openings in ARS?
Announcements of ARS job openings can be accessed on the ARS World Wide Web site. The address is http://wwww.ars.usda.gov. Announcements are available at college placement offices and Federal Job Information Centers. Professional societies and faculty members associated with ARS may also have information on vacancies, and position announcements are posted at ARS laboratories and research facilities nationwide—many are located on or near college campuses. You may also obtain job information by writing to USDA Agricultural Research Service, Human Resources Division, 6305 Ivy Lane, Room 117, Greenbelt, MD 20770-1435.

USDA research positions in the life sciences are advertised in vacancy listings. You must apply specifically for an announced vacancy. After your basic qualifications have been reviewed, your undergraduate and graduate work, references, and other materials are evaluated by scientists in your field against the requirements of the job. Those applicants identified as best qualified for the position are referred to the selecting official or supervisor of the position for final consideration and selection.

What are the starting salaries?
Research scientists in ARS usually start at the GS-11 or GS-12 level (salaries ranging from the thirties to fifties depending on qualifications). In addition, Federal employment provides an attractive benefits package that includes paid holidays, flexible work schedules, vacation and sick leave, health and life insurance coverage, and a retirement plan.

Since ARS is a Federal employer, how do I apply for a position?
You may send a resumé, curriculum vitae, or Optional Application for Federal Employment (OF-612). A copy of your transcripts must be attached. Be sure your application includes: the vacancy announcement number, title, and grade(s); your citizenship; and highest educational level achieved with type and year of degree. If you submit a resumé, the following information must be included: Full name, ZIP Code mailing address, telephone number, Social Security number, country of citizenship, veterans' preference (if any), reinstatement eligibility, and highest Federal civilian grade held. Note education (name of high school, college, etc., type and year of degree), work experience (give job title, duties and accomplishments, employer's name and address and phone number, hours per week, and salary), and other qualifications that may be considered (training courses, job-related skills, certificates and licenses, honors, awards, etc.).

A field experiment with corn, sorghum, and sunflowers generates information to be fed into computer plant-growth models. (K3222-1)

Q&A

Must I be a U.S. citizen to work for ARS?

U.S. citizenship is required for employment as a career scientist with ARS.

How does ARS make selections?

The selection of new scientists is based on education and research backgrounds and the specific needs of the agency. ARS professional scientific positions generally require a doctoral degree (or substantial progress toward a doctoral degree) in one of the physical or biological sciences. Written tests are not part of the selection process.

What opportunities exist for my professional development?

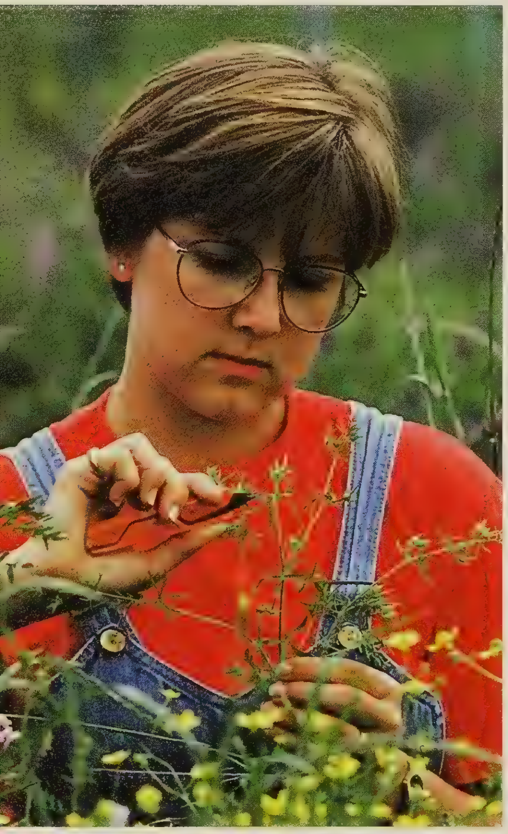
Because USDA must respond promptly to the changing technological needs of U.S. and world agriculture, ARS scientists must keep up-to-date on the most significant advances in their respective fields of research. To maintain the highest level of scientific expertise, ARS provides its scientists with as many opportunities for professional development as possible.

ARS encourages its researchers to attend scientific meetings, symposia, conferences, and conventions throughout the United States and around the world. Travel and participation expenses are usually paid by the Government. The proximity of most ARS facilities to college and university campuses also serves as an inducement to continuing education. Research-related graduate and postgraduate courses can often be taken at Government expense during official time or off-duty hours.

Professional development can also include supervisory, managerial, and administrative training, and several courses from Government and non-Government sources are available for this purpose.

How does ARS reward excellence in job performance?

ARS strongly believes that recognition of a job well done is the best motivation to encourage and sustain outstanding performance. Scientists can receive monetary awards for outstanding performance. In addition to these individual awards, ARS has several special award programs that recognize scientific excellence.



Technician Shawn Thomas collects wild geranium heads to check the effectiveness of biocontrols in a field. (K3664-7)

Q How will my research position be evaluated for promotions?

A In ARS, research scientists' positions are evaluated for promotion at set intervals by panels. The panels consist of a management representative, a personnel representative, and five research scientists. Two of the research scientists on the panel must be in the same or similar work area as the researcher being evaluated. The information submitted to the panel for review is prepared by the scientist and includes summaries of the scientist's most important accomplishments and selected publications.

Q What are the attitude and policy of ARS toward its scientists publishing their research findings?

A Technology transfer and the timely dissemination of new knowledge are essential to the overall mission of ARS. The research process is considered incomplete until the results are reported and made available to the scientific community at large. ARS scientists are encouraged to present their findings in refereed journals, in agency and department publications, and at scientific meetings. Personal recognition and full professional credit are always given for authorship.

Q Am I allowed to benefit financially from patents based on my research with ARS?

A ARS has always been one of the leading Federal agencies to provide incentives to reward its researchers for patenting research results to enhance commercial development. For example, ARS provides that inventors share 25 percent of all income received from patent licensing activities. Annual Technology Transfer Awards are given to outstanding researchers where the research has been successfully transferred to the public. Patents are recognized by ARS as potentially having equal value to articles in refereed journals as documentation of research accomplishments, particularly where the patented research is transferred to the public.

[illegible] chemists Bill Goynes (center) and Eugen Blanchard examine scanning electron micrographs (SEMs) that show the structure of a white speck [illegible] at the USDA-ARS Southern Regional Research Center in New Orleans, LA. (K7[illegible])

Ready for the greenhouse, new varieties of seedless grapes are transplanted from growth chamber containers to soil pots. (K3681-3)

Distinguished Scientist of the Year

This honor, the highest conferred by the Agricultural Research Service, is awarded annually for scientific achievement and leadership.

Ronald Fayer, Beltsville, Maryland

Patrick V. Vail, Fresno, California

Lawrence A. Johnson, Beltsville, Maryland

Forrest H. Neilsen, Grand Forks, North Dakota

Virginia H. Holsinger, Wyndmoor, Pennsylvania

Vernon G. Pursel, Beltsville, Maryland

John R. Gorham, Pullman, Washington

Norman F. Cheville, Ames, Iowa

Chester C. McWhorter, Stoneville, Mississippi

Janice M. Miller, Ames, Iowa

Thomas J. Sexton, Beltsville, Maryland

Richard F. Wilson, Raleigh, North Carolina

Agricultural Research Service Locations Throughout the United States

Area Headquarters

Research Centers
- ERRC, Philadelphia, PA
- NCAUR, Peoria, IL
- SRRC, New Orleans, LA
- WRRC, Albany, CA
- BARC, Beltsville, MD
- NADC, Ames, IA
- PIADC, Plum Island, NY
- Richard B. Russell Research Center, Athens, GA
- Roman L. Hruska U.S. Meat Animal Research Center, Clay Center, NE
- Jamie Whitten Delta States Research Center, Stoneville, MS

Human Nutrition Research Centers
- Beltsville, MD
- Boston, MA
- Grand Forks, ND
- Houston, TX
- San Francisco, CA

Research Locations

Does not include the 41 U.S. and international worksites.

Why Join the Agricultural Research Service?

The Agricultural Research Service is a satisfying, exciting, and professionally rewarding place for a scientist to work.

It's satisfying because our research solves important problems. ARS scientists provide new approaches and new technologies needed by consumers, producers, and industry. We design these approaches in a manner that is safe to our environment. We seek ways to produce more and better food and fiber... to control insect pests and weeds safely... to get food to consumers in better condition... to improve human nutrition... to help protect soil, water, and air... and to find new uses for agricultural commodities.

It's exciting because so much of our research is on the leading edge of science... in highly visible programs with broad public support. Current research involves biotechnology, including molecular biology, genetic engineering, and membrane research... application of theories of artificial intelligence to computer technology... innovative approaches to pest control through insect neurochemistry and use of pheromones. Each ARS scientist is employed because of his or her unique training and abilities as a researcher.

It's professionally rewarding because each ARS scientist is a dedicated full-time researcher. Our researchers work in modern, well-equipped laboratories and enjoy a free and open association with colleagues within the agency, universities, and industry. Paid attendance at professional meetings and symposia and assistance in securing agency patents also help make a career with ARS rewarding and satisfying.

Private industry joins hands with Federal research. Randy Deaton, left, from Monsanto Co., helps ARS geneticist Doug Wilson assess damage to a cotton plant from marauding beet armyworms. (K4374-1)

Workstyle

Personal Development and Career Advancement

ARS career employees enjoy opportunities for individual development. The agency provides training and in some cases tuition assistance so employees can pursue advanced education or participate in programs that promote self-improvement, training, and career advancement.

Equal Employment Opportunity

ARS is determined to recruit and advance qualified employees from all cultural and ethnic backgrounds. Human relations and sensitivity training help our people work smoothly with peers from different backgrounds. Employees are considered for employment, promotion, and other worklife opportunities based on their own merits without regard to race, color, sex, marital status, religion, age, nondisqualifying disability, national origin, political affiliation, or any other nonmerit consideration.

Retirement Plan

Federal retirement benefits feature a portable, Social Security-based annuity program supported by Government and worker contributions. Employees may supplement their future retirement income by participating in the Thrift Savings Plan, which offers the advantages of an individual retirement account. The Government contributes proportionately to Thrift Savings accounts based on how much money the worker has contributed. Under the plan's supervision, employees may choose how their funds are invested.

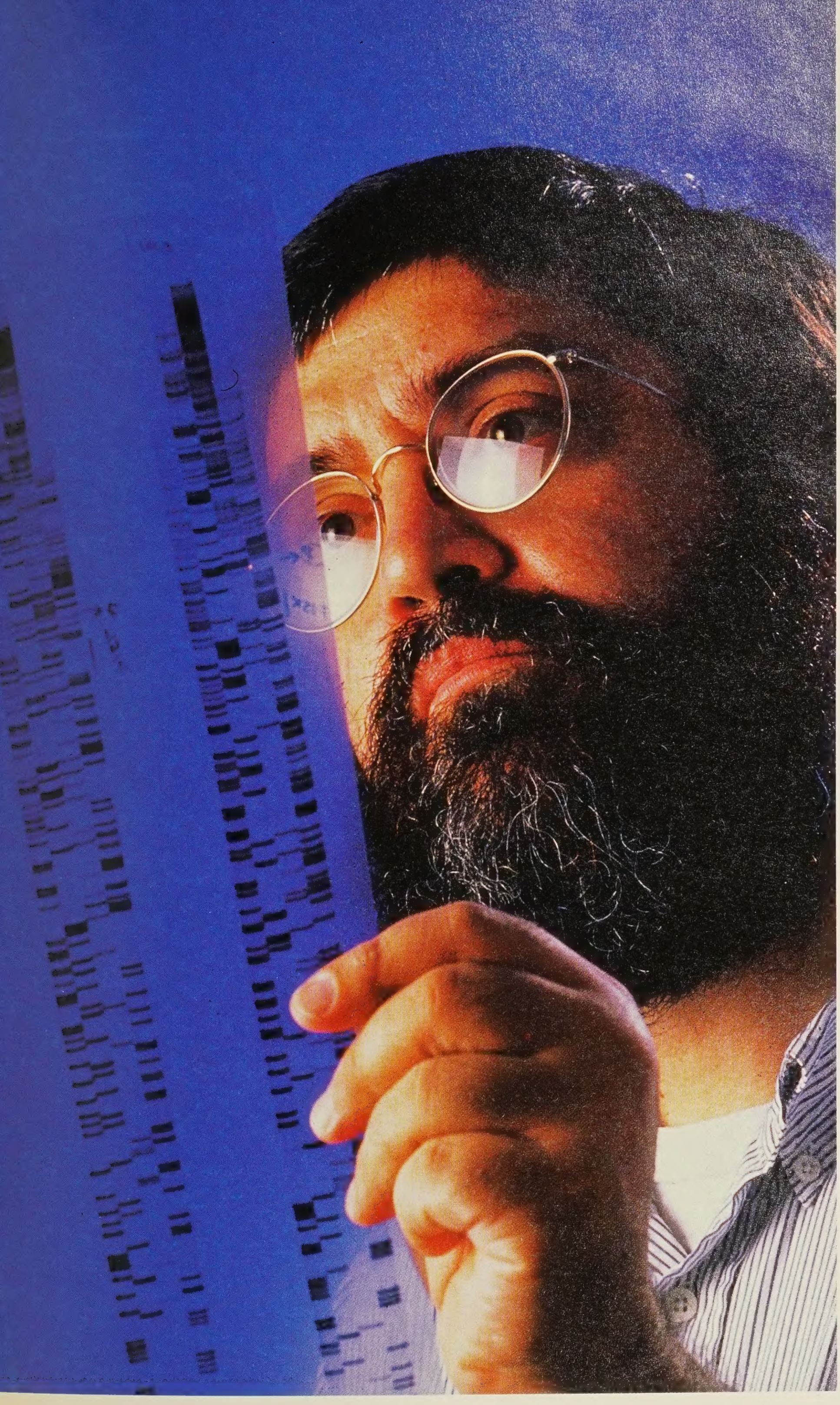
Flexible Work Schedules

Employees' schedules are often individualized. They may be designed to meet both job demands and employees' personal needs. Workers stationed in offices or laboratories can usually vary their daily work hours, take variable days off, or choose other flexible schedules.

Quality of Worklife

The combination of generous benefits and progressive personnel policies gives ARS employees an unusually high quality of worklife. The agency strives to develop strategies that anticipate employee needs and contribute to their well-being. For example, ARS provides:

- Free, confidential counseling services to employees with personal, family, or financial problems.
- A leave donation program so employees can help coworkers who are stricken with major illnesses or personal emergencies.
- Opportunities for employees to participate actively in policymaking through task groups and team-building experiences.
- Flexible work schedules that allow workers to vary their daily work hours and/or days off.
- Employment and accommodations for workers with disabilities.
- Information about daycare facilities available at many locations.
- Fitness centers and credit unions at many locations.
- Paid holidays, vacation, and sick leave.



Plant molecular biologist Athanasios Theologis hunts for genes related to plant aging. Electrophoresis allows him to separate and match nucleotide sequences of DNA fragments. (K3489-1)

Science Hall of Fame

The ARS Science Hall of Fame honors the lifetime achievements of outstanding scientists who are either retired or eligible to retire. Current members include:

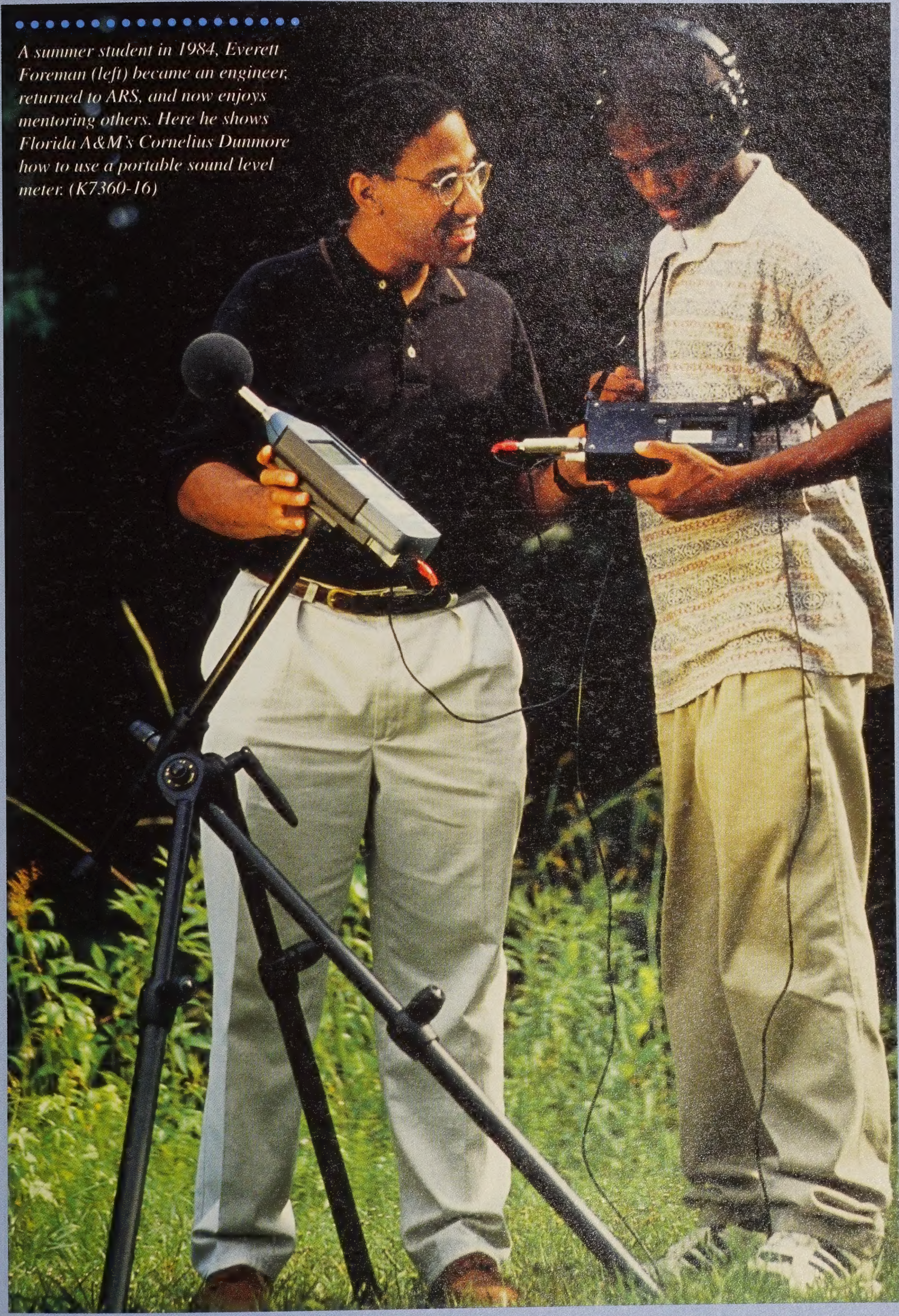
Howard L. Bachrach
Fred W. Blaisdell
Myron K. Brakke
Glenn W. Burton
Theodore C. Byerly
Francis E. Clark
Douglas R. Dewey
Gordon E. Dickerson
Theodor O. Diener
Herbert J. Dutton
Edgar E. Hartwig
Charles Jackson Hearn
Ralph E. Hodgson
Robert W. Holley
Virgil A. Johnson
Edward F. Knipling
Hamish N. Munro
Karl H. Norris
Wilson A. Reeves
Ernest R. Sears
George F. Sprague
John F. Sullivan
Jose Vicente-Chandler
Orville A. Vogel
Cecil H. Wadleigh
John H. Weinberger
Walter H. Wischmeier

The ARS Postdoctoral Research Associate Program

Even after earning their doctoral degrees, many scientists are still uncertain about their professional future and remain at academic institutions to continue their studies while exploring career possibilities. With this in mind, ARS offers new Ph.D.'s a chance to compete in its Postdoctoral Research Associate Program. This program provides for short-term, noncareer appointments to salaried positions on specific research projects. Applicants must have completed requirements for a Ph.D. degree before their employment; ARS prefers candidates with no more than 3 years of postdoctoral experience. The agency usually hires research associates at the GS-11 grade level. They earn vacation and sick leave at the same rate as all new employees in the Federal Government. Associates with appointments of more than 1 year are also eligible for health and life insurance benefits.

Since 1980, more than 750 candidates have signed up for the 2-year ARS Postdoctoral Research Associate Program. And during the past 5 years, over 100 of them have earned employment as permanent, full-time ARS scientists. The program offers a unique opportunity for recent recipients of the doctoral degree to conduct critically needed basic research in association with some of the most prominent scientists in their field. It also enables them to receive advanced and highly specialized training and experience that may not be available anywhere else.

Food technologist Alley Watada (left) and horticulturist Ling Qi, who is visiting from China, prepare shredded carrots and other fresh-cut produce for automated measurement of respiration rate and ethylene production a the USDA-ARS Horticultural Crops Quality Laboratory in Beltsville, MD.
(K7514-7)



A summer student in 1984, Everett Foreman (left) became an engineer, returned to ARS, and now enjoys mentoring others. Here he shows Florida A&M's Cornelius Dunmore how to use a portable sound level meter. (K7360-16)